WHAT IS CLAIMED IS:

1. A flow monitoring system comprising:

a first temperature-sensitive resistive device, thermally coupled to a first portion of a fluid transfer apparatus, for producing a first temperature-dependant voltage signal representative of the temperature of the fluid within the first portion of the fluid transfer apparatus;

a first current control device, coupled to the first temperature-sensitive resistive device, for controlling a first current signal flowing through the first temperature-sensitive resistive device;

a second temperature-sensitive resistive device, thermally coupled to a second portion of the fluid transfer apparatus, for producing a second temperature-dependant voltage signal representative of the temperature of the fluid within the second portion of the fluid transfer apparatus;

a second current control device, coupled to the second temperature-sensitive resistive device, for controlling a second current signal flowing through the second temperature-sensitive resistive device; and

a monitoring circuit for monitoring the first and second temperature-dependant voltage signals and producing an output signal representative of the volume of fluid passing through the fluid transfer apparatus.

2. The flow monitoring system of claim 1 wherein the first and second current signals are essentially equal.

3. The flow monitoring system of claim 1 wherein:

the first current controlling device includes a first transistor for controlling the first current signal flowing through the first temperature-sensitive resistive device; and

the second current controlling device includes a second transistor for controlling the second current signal flowing through the second temperature-sensitive resistive device.

4. The flow monitoring system of claim 3 wherein the first and second transistors are field effect transistors.

5. The flow monitoring system of claim 3 wherein:

the first current controlling device includes a first amplification circuit coupled to the first transistor, wherein the first amplification circuit is responsive to a first control signal and provides a first control voltage to the first transistor; and

the second current controlling device includes a second amplification circuit coupled to the second transistor, wherein the second amplification circuit is responsive to a second control signal and provides a second control voltage to the second transistor.

6. The flow monitoring system of claim 5 wherein the first and second amplification circuits are operational amplifiers.

7. The flow monitoring system of claim 5 wherein the first and second control signals are the same signal.

8. The flow monitoring system of claim 5 wherein:

the first current controlling device includes a first control resistive device coupled to the first transistor, wherein the first current signal flows through the first control resistive device and generates a first feedback signal that is provided to the first amplification circuit; and

the second current controlling device includes a second control resistive device coupled to the second transistor, wherein the second current signal flows through the second control resistive device and generates a second feedback signal

that is provided to the second amplification circuit.

9. The flow monitoring system of claim 8 further comprising a resistive calibration device, coupled to the first and second control resistive devices, for adjusting the resistive values associated with the first and second control resistive devices.

10. The flow monitoring system of claim 9 wherein the resistive calibration device includes a digital potentiometer.

11. The flow monitoring system of claim 1 wherein the monitoring circuit includes an instrumentation amplifier for producing the output signal, wherein the instrumentation amplifier includes:

a first input terminal for receiving the first temperature-dependant voltage signal; and

a second input terminal for receiving the second temperature-dependant voltage signal.

12. The flow monitoring system of claim 11 wherein a gain factor of the instrumentation amplifier is defined by the resistive values associated with a plurality of resistors.

13. The flow monitoring system of claim 12 wherein the gain factor is approximately twenty.

14. The flow monitoring system of claim 11 wherein the monitoring circuit includes a low-pass filter circuit, coupled to the instrumentation amplifier, for filtering the output signal.

15. The flow monitoring system of claim 14 wherein the low-pass filter circuit is a second-order-low pass filter circuit configured to have a three-decibel breakpoint of approximately 150 Hertz.

16. The flow monitoring system of claim 11 wherein the monitoring circuit includes a zero calibration device for applying a calibration voltage signal to the first and second input terminals of the instrumentation amplifier.

17. The flow monitoring system of claim 16 wherein the zero calibration device includes a digital switch for temporally connecting the first and second input terminals of the instrumentation amplifier.

18. The flow monitoring system of claim 17 wherein the calibration voltage signal is one of the first and second temperature-dependant voltage signals.

19. The flow monitoring system of claim 1 wherein the monitoring circuit includes:

a first shunt resistor for coupling the monitoring circuit to the first temperature-sensitive resistive device; and

a second shunt resistor for coupling the monitoring circuit to the second temperature-sensitive resistive device.

20. The flow monitoring system of claim 1 wherein the fluid is a liquid fluid.

21. The flow monitoring system of claim 1 wherein the fluid is a gaseous fluid.

22. The flow monitoring system of claim 1 wherein the transfer apparatus is a tube.

23. The flow monitoring system of claim 22 wherein the tube is a bypass tube.

24. The flow monitoring system of claim 1 wherein the first and second temperature-sensitive resistive devices are constructed of a high positive temperature coefficient resistive material.

25. The flow monitoring system of claim 24 wherein the high positive temperature coefficient resistive material has a temperature coefficient of approximately 4500 ppm/°C.

26. A flow monitoring system comprising:

a first temperature-sensitive resistive device, thermally coupled to a first portion of a fluid transfer apparatus, for producing a first temperature-dependant voltage signal representative of the temperature of the fluid within the first portion of the fluid transfer apparatus;

a first current control device, coupled to the first temperature-sensitive resistive device, for controlling a first current signal flowing through the first temperature-sensitive resistive device;

a second temperature-sensitive resistive device, thermally coupled to a second portion of the fluid transfer apparatus, for producing a second temperature-dependant voltage signal representative of the temperature of the fluid within the second portion of the fluid transfer apparatus;

a second current control device, coupled to the second temperature-sensitive resistive device, for controlling a second current signal flowing through the second temperature-sensitive resistive device; and

an instrumentation amplifier for producing an output signal representative of the volume of fluid passing through the fluid transfer apparatus, wherein the instrumentation amplifier includes:

a first input terminal for receiving the first temperature-dependant voltage signal; and

a second input terminal for receiving the second temperature-dependant voltage signal.

27. The flow monitoring system of claim 26 wherein a gain factor of the instrumentation amplifier is defined by the resistive values associated with a plurality of resistors.

28. The flow monitoring system of claim 26 wherein the instrumentation amplifier includes a low-pass filter circuit for filtering the output signal.

29. A flow monitoring system comprising:

a first temperature-sensitive resistive device for producing a first temperature-dependant voltage signal representative of the temperature proximate the first temperature-sensitive resistive device;

a first current control device, coupled to the first temperature-sensitive resistive device, for controlling a first current signal flowing through the first temperature-sensitive resistive device;

a second temperature-sensitive resistive device for producing a second temperature-dependant voltage signal representative of the temperature proximate the second temperature-sensitive resistive device;

a second current control device, coupled to the second temperature-sensitive resistive device, for controlling a second current signal flowing through the second temperature-sensitive resistive device; and

a monitoring circuit for monitoring the first and second temperature-dependant voltage signals and producing an output signal representative of the difference between the temperature proximate the first temperature-sensitive resistive device and the second temperature-sensitive resistive device.

30. The flow monitoring system of claim 29 wherein the first and second temperature-sensitive resistive devices are constructed of a high positive temperature coefficient resistive material.

31. The flow monitoring system of claim 30 wherein the high positive temperature coefficient resistive material has a temperature coefficient of approximately 4500 ppm/°C.

32. A flow monitoring system comprising:

a first temperature-sensitive resistive device, thermally coupled to a first portion of a fluid transfer apparatus, for producing a first temperature-dependant voltage signal representative of the temperature of the fluid within the first portion of the fluid transfer apparatus;

a first current control device that is coupled to the first temperature-sensitive resistive device and includes a first transistor for controlling a first current signal flowing through the first temperature-sensitive resistive device;

a second temperature-sensitive resistive device, thermally coupled to a second portion of the fluid transfer apparatus, for producing a second temperature-dependant voltage signal representative of the temperature of the fluid within the second portion of the fluid transfer apparatus; and

a second current control device that is coupled to the second temperature-sensitive resistive device and includes a second transistor for controlling a second current signal flowing through the second temperature-sensitive resistive device;

33. The flow monitoring system of claim 32 wherein:

the first current controlling device includes a first amplification circuit coupled to the first transistor, wherein the first amplification circuit is responsive to a first control signal and provides a first control voltage to the first transistor; and

the second current controlling device includes a second amplification circuit coupled to the second transistor, wherein the second amplification circuit is responsive to a second control signal and provides a second control voltage to the second transistor.

34. The flow monitoring system of claim 33 wherein:

the first current controlling device includes a first control resistive device coupled to the first transistor, wherein the first current signal flows through the first control resistive device and generates a first feedback signal that is provided to the first amplification circuit; and

the second current controlling device includes a second control resistive device coupled to the second transistor, wherein the second current signal flows through the second control resistive device and generates a second feedback signal that is provided to the second amplification circuit.

35. The flow monitoring system of claim 34 further comprising a resistive calibration device, coupled to the first and second control resistive devices, for adjusting the resistive values associated with the first and second control resistive devices.

36. A flow monitoring system comprising:

a first current control device for controlling a first current signal flowing through a first temperature-sensitive resistive device, wherein the first temperature-sensitive resistive device produces a first temperature-dependant voltage signal representative of the temperature of fluid within a first portion of a fluid transfer apparatus;

a second current control device for controlling a second current signal flowing through a second temperature-sensitive resistive device, wherein the second temperature-sensitive resistive device produces a second temperature-dependant voltage signal representative of the temperature of the fluid within a second portion of the fluid transfer apparatus; and

a monitoring circuit for monitoring the first and second temperature-dependant voltage signals and producing an output signal representative of the volume of fluid passing through the fluid transfer apparatus.